Patented Oct. 21, 1952 2,614,998

UNITED STATES PATENT OFFICE

2,614,998

LOW WATER-LOSS CEMENT SLURRY

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No Drawing. Application September 19, 1949, Serial No. 116,628

18 Claims. (Cl. 260—29.6)

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This invention relates to low water-loss cement slurries. In one aspect, it relates to low water-loss cement slurries comprising a hydraulic cement, sufficient water to form a slurry, and an effective amount of a water-loss reducer. In another aspect, it relates to low water-loss cements containing a non-cement, inert, granular aggregate material. In still another aspect, it relates to a low water-loss cement slurry containing an effective amount of a set-retarder. In still another aspect, it relates to a hydraulic cement slurry having a retarded set.

In the art of cementing oil wells and in grouting cracks in masonry structures there is a tendency for the cement slurry to lose water to such an extent that it becomes dehydrated, set, or cracked prematurely. The result is that it cannot be properly placed in position because of an increase in viscosity of the slurry, and resulting increase in the force necessary to pump or move the slurry into position. This undesirable dehydration is increased in many oil wells by the modern practice of scratching, or scraping the drilling mud from the wall of the well by mechanical means prior to placing the cement, which often exposes porous formations which will absorb the water from the slurry. This is particularly important when oil sands are penetrated. Artificial contamination of oil sands with water will often cause shaley impurities in the sand to swell and reduce the permeability of said oil sand to a very great extent. Therefore water lost from the slurry tends to seal off the formation to oil flow. When it is intended to cement with slurry, and then gun perforate the hardened cement, the gun perforator may not be able to penetrate into the region beyond that in which the shaley impurities are swollen by the water extracted from the slurry. In such cases the oil production rate of the well may be severely reduced by water contamination from the slurry.

I have discovered a method for retarding the set of cement and for reducing the filtration of water from cement slurries to the absorbent surrounding formations and the resulting contamination of such formations. I do this by adding to the cement slurry a small amount of a water-soluble or dispersible resin selected from the group consisting of water-soluble alkali salts of partially hydrolyzed polyacrylamide and polyacrylic acid.

One object of the present invention is to provide an improved low water-loss cement slurry useful for grouting in general, for cementing the walls of wells, and for cementing pipe in wells.

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Another object is to provide a low water-loss cement which will not contaminate the earth formations in bore holes with water to any substantial degree.

Another object is to provide a cement slurry suitable for use in oil well cementing operations.

Another object is to provide a low water-loss cement.

Another object is to provide a cement having a retarded set.

Numerous other objects and advantages will be apparent upon reading the accompanying specification and claims.

In preparing the low-water-loss cement slurry, the dry ingredients, comprising hydraulic cement, the additives for increasing the time of set, and reducing the water loss, and the inert filler material, such as sand or crushed limestone, may be mixed together and later mixed with water. Alternatively, the water-loss reducers may be mixed separately with hot or cold water, and then aded to the cement to form the slurry. The mixing of the hydraulic cement with water must, of course, be done promptly before placing the slurry in position.

The amount of my water soluble resins required will ordinarily lie between 0.10 and 3.0 per cent based on the weight of dry cement. The preferred amount will ordinarily lie between 0.25 and 2.0 per cent. If less additive is used, the resulting water-loss reduction or set retardation will be correspondingly low. Above the upper limit, the results are too great for practical uses.

By hydraulic cement we intend to include all mixtures of lime, silica, and alumina, or of lime and magnesia, silica, and alumina and iron oxide as are commonly known as hydraulic cements. Hydraulic cements include hydraulic limes, grappier cements, puzzolan cements, natural cements, and Portland cements. Puzzolan cements include slag cements made from slaked lime and granulated blast furnace slag. Because of its superior strength, Portland cement is preferred among the hydraulic cements. In the art, hydraulic cements are recognized as a definite class, and as results of value may be obtained with any member of that class, it is intended to claim all hydraulic cements.

In most oil well cementing and grouting operations it is generally desirable to use neat cement for added strength, but, obviously, it is always possible to add a certain amount of an inert granular filling material or aggregate such as sand, ground limestone, or any of the other